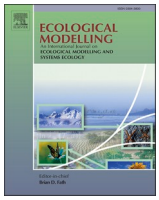
Ecological Modelling 507 (2025) 111119

Contents lists available at ScienceDirect

Ecological Modelling

journal homepage: www.elsevier.com/locate/ecolmodel



Ecological modelling for transformation

In a world where biodiversity and ecosystem services are at high risk, business as usual is no longer an option. Transforming the way societies manage natural resources is urgently needed, but requires a better understanding of how ecological and socio-ecological systems respond to change and human intervention. Ecological modelling must therefore aim to predict the response to change and address multiple scales of time, space and organisation relevant to management. This special issue follows the 9th European Conference on Ecological Modelling in Leipzig, Germany (ECEM 2023) and includes contributions that directly or indirectly support transformation and change.

ECEM 2023 continues a series of conferences initiated by the European Chapter of the International Society for Ecological Modelling (ISEM). The conference took place in September 2023 at the Helmholtz Centre for Environmental Research - UFZ in Leipzig, Germany, and was organised by the Department of Ecological Modelling. It was attended by 350 participants from 28 countries. Given the lack of such meetings due to the COVID pandemic, they all agreed that such face-to-face meetings are essential to be inspired and to inspire others, to meet new colleagues and to develop new ideas and plans.

This special issue of Ecological Modelling brings together a diverse array of contributions that advance our understanding of complex ecological processes through innovative modelling approaches. The studies span a wide range of topics - from forest dynamics to socio-ecological modelling, predictive species distribution and ecotoxicological assessments, marine and coastal ecosystem dynamics, as well as agricultural landscapes and grassland management (Fig. 1). Together, these articles offer novel insights into ecosystem resilience, the interplay between environmental stressors and human management, and the methodological advances needed to address today's ecological challenges. In doing so, these contributions help us to make ecological modelling fit for supporting transformation. Interestingly, only one paper mentions 'theory' in its title, reminding us that while it is important to model specific systems and questions, ecological modelling also needs to help in developing and testing theories and general concepts.

In the following we briefly summarize the 24 contributions to the special issue (Table 1), which we grouped into four broad categories.

1. Investigate land use dynamics with agent-based modelling in socio-ecological systems

This category summarises work that uses agent-based models or virtual ecosystem approaches to investigate land use and environmental dynamics. This includes contributions that model patch dynamics, land use decisions or complex adaptive socio-ecological systems.

Curk et al. (2025). The study examines the advantages and disadvantages of using social information for carcass detection in white-backed vultures in Namibia through an agent-based model simulating three foraging strategies: non-social searching, local enhancement, and vulture chains. The results indicate that social foraging strategies are generally more efficient than non-social searching, with vulture chains being particularly beneficial at high vulture densities.

Ewers et al. (2024). This paper argues for the need to develop holistic ecosystem models that integrate biotic processes with abiotic drivers such as temperature and hydrology to predict emergent phenomena. The proposed Virtual Ecosystem framework aims to reconcile diverse ecological perspectives by simulating organismal physiology, energy and nutrient cycles, and spatial processes at multiple scales.

Ferraro et al. (2024). This study uses an agent-based model to simulate land use dynamics in the Pampas region of Argentina under different economic and climatic scenarios. It reveals how crop price relationships and climate variability shape agricultural decisions and environmental outcomes.

Letschert et al. (2025). To simulate fishing dynamics in the southern North Sea, this study presents an agent-based model that integrates empirical data with behavioural theory. The model captures fishermen's multifaceted decision making - including risk aversion, habitual behaviour and social influences - to assess the impact of offshore wind farm expansion and rising fuel prices on fishery performance.

Wang et al. (2025). This study presents an agent-based model that simulates the interactions between fire and grazing on a hypothetical 4000-ha ranch, thereby capturing the spatiotemporal dynamics of woody plant encroachment, forage production, and cattle performance in a savanna-type ecosystem. The model explores how different adaptive management strategies—via adjustments in stocking rates and prescribed fire thresholds—can influence long-term ranch ecological condition and economic outputs.

2. Agricultural landscapes and grasslands in transformation

This category includes contributions that deal with the ecological, economic and land use-related dynamics in agricultural landscapes and grasslands. The focus is on individual-based models and theoretical approaches that analyse the interactions between management decisions, disturbances and the resulting ecological processes.

Crispim-Mendes et al. (2024). This study employs an individual-based demographic model to examine how variations in patch size, internal quality, connectivity, and patch lifespan influence local population dynamics in ephemeral habitats. Results indicate that

https://doi.org/10.1016/j.ecolmodel.2025.111119
Received 27 March 2025; Accepted 1 April 2025
Available online 21 April 2025

Fig. 1. Ecological modelling is supporting transformation as many ecosystems and their management must adapt to ongoing change. Word cloud created based on the words used in the titles and abstracts of all contributions in this Special Issue 'Ecological Modelling for Transformation' (created with www.wordclouds.com). Background image with a diverse landscape was generated with DALL-E from OpenAI.

higher patch quality and longer lifespans enhance the likelihood of a patch becoming a temporary source.

Marques et al. (2024). This paper presents an individual-based model that quantifies the impacts of anthropogenic mortality on territorial predators (i.e., electrocution by power lines), using Bonelli's eagle as a case study. It differentiates between territorial and non-territorial individuals to assess how spatial patterns of additional mortality affect overall population dynamics.

Nothaaß and Huth (2025). The study analyzes how the sudden extinction of a species alters the equilibrium abundances in a spatial competition model and reshapes the overall community composition in grassland ecosystems. It compares geometric and exponential rank-abundance scenarios to illustrate the cascading effects of extinction on inferior competitors.

Ogawa et al. (2024). The study examines how farmland birds adjust their habitat selection relative to the availability of different land-use types—both those under agri-environment schemes and conventional land uses—using hierarchical distance sampling and mixed-effects modelling. Results indicate that birds tend to show negative functional responses (i.e. reduced selection) for certain habitats as those habitats become more widely available, suggesting that habitat availability is a key driver of observed occurrence patterns.

3. Modelling forest dynamics and their management in a changing world

Contributions in this category deal with growth processes, drought and other stress effects on forested landscapes. Tree mortality and economic-ecological optimisation of forest management seem to be of interest for many studies.

Anders et al. (2025). This paper develops logistic regression models for drought-related mortality of Norway spruce, calibrated with historical mortality data from German forest surveys, and integrates these data-driven models into a dynamic vegetation model. Future climate simulations predict periodic spikes in mortality that could substantially reduce aboveground biomass and potential wood harvest, highlighting a severe risk for spruce forest dieback.

Axer et al. (2025). The paper introduces a quantile regression approach implemented in the R package quaxnat to estimate the potential natural regeneration density of Douglas-fir as a function of distance to seed source using various dispersal kernels. This method is applied to extensive forest inventory data to inform management and conservation strategies.

Boyce et al. (2025). The paper investigates oak regeneration by comparing different sizes of small-scale clearings and uses a demographic forest model based on the Perfect Plasticity Approximation to simulate long-term overstory dynamics. It provides management insights by estimating the annual planting rate needed to achieve a target oak overstory cover in the Leipzig Floodplain Forest.

Elles et al. (2025). This study employs the Perfect Plasticity Approximation to simulate long-term changes in species composition in the Leipzig Floodplain Forest under different groundwater conditions. The model projects that simply raising groundwater levels may not suffice to conserve key floodplain species, highlighting the need for integrated management measures.

Holtmann et al. (2024). The study investigates the impact of multi-year droughts on German forests, focusing on tree mortality, biomass loss, and productivity decline using an individual-based forest growth model. The results indicate that prolonged droughts significantly reduce gross primary production and aboveground biomass, with monocultures and even-aged forests being more vulnerable than mixed and uneven-aged forests.

Rammer et al. (2024). This overview paper synthesizes 12 years of development of the iLand model, which simulates forest dynamics at the individual-tree level across heterogeneous landscapes. It details how iLand integrates processes such as growth, mortality, regeneration, and disturbances to project forest trajectories under changing conditions.

Scheiter et al. (2024). This work employs a trait-based dynamic vegetation model to simulate drought impacts on biomass, mortality, and recovery in tropical savannas and forests under future climate scenarios. It examines how hydraulic traits and demographic responses drive resilience and adaptation during and after prolonged drought periods.

Schorn et al. (2025). This study introduces a novel ecological-economic optimization framework that couples the Perfect Plasticity Approximation demographic forest model with a bioeconomic module to simulate forest dynamics and optimize timber harvesting strategies while conserving biodiversity. Using repeated inventory data

Table 1
Overview of all contributions to the special issue. For each article, we have listed the key question, the ecosystem and the model type.

Study	Title	Scientific Key Question	Ecosystem	Model type
Anders et al. (2025)	Modelling Past and Future Impacts of Droughts on Tree Mortality and Carbon Storage in Norway Spruce Stands in Germany	Which climatic and weather-related factors best predict drought-induced Norway spruce mortality, and how will future climate scenarios affect forest biomass and carbon storage?	Norway spruce-forests in Germany	Dynamic global vegetation model augmented with logistic regression models
Axer et al. (2025)	Quantile regression for estimating Douglas-fir natural regeneration potential using the R package quaxnat: Advanced ecological modeling for the management of nature conservation and silviculture	How does the distance to seed sources influence Douglas-fir natural regeneration, and which dispersal kernel best captures this relationship?	Forest ecosystems in Germany	Quantile regression model and spatial dispersal kernels
Boyce et al. (2025)	How can oak regeneration in the Leipzig Floodplain Forest be effectively supported by femel plantations? Application of a demographic forest model	Can small-scale femel plantations effectively promote oak regeneration, and what planting intensity is required to maintain a certain oak overstory cover?	Temperate floodplain forest in Germany	Demographic forest model using the Perfect Plasticity Approximation
Crispim-Mendes et al. (2024)	Patch spatial attributes and time to disturbance affect the emergence of source local populations within ephemeral habitats	How do spatial attributes and patch lifespan interact to drive the emergence of source local populations in ephemeral habitats?	Ephemeral habitats in agricultural landscapes	Individual-based demographic model
Curk et al. (2025)	Advantages and disadvantages of using social information for carcass detection–A case study using white-backed vultures.	How do different environmental conditions influence the use of social information in the foraging behavior of white-backed vultures?	Savanna ecosystem in Namibia	Agent-based model
Elles et al. (2025)	Supporting conservation planning in a national biodiversity hotspot – Projecting species composition across a groundwater level gradient using a demographic forest model	Can hydrological restoration via raised groundwater levels sustain the conservation of key floodplain tree species in the Leipzig Floodplain Forest?	Floodplain forest in Germany	Demographic forest model using the Perfect Plasticity Approximation
Ewers et al. (2024)	New Insights to be Gained from a Virtual Ecosystem	How can a holistic ecosystem model like the Virtual Ecosystem enhance our understanding of emergent ecosystem properties, stability, and resilience under a rapidly changing climate?	Terrestrial ecosystems	process-based ecosystem model
Ferraro et al. (2024)	Predicting land use and environmental dynamics in Argentina's Pampas region: An agent-based modeling approach across varied price and climatic scenarios	How do economic determinants and climatic scenarios interact to shape land use dynamics in Argentina's Pampas region?	Agricultural landscapes in Argentina	Agent-based model
Guisnet et al. (2025)	Global sensitivity analysis of the harmonized Lemna model	Which input factors and their interactions most influence the response of the Lemna model to pesticide exposure under various environmental regimes?	Aquatic ecosystems	Mechanistic effect model
Holtmann et al. (2024)	Assessing the impact of multi-year droughts on German forests in the context of increased tree mortality	How do multi-year droughts affect the biomass and productivity of German forests?	Temperate forest ecosystems in Germany	Individual-based forest growth model
Letschert et al. (2025)	Simulating fishery dynamics by combining empirical data and behavioral theory	How do complex human decision-making processes, influenced by behavioral factors and economic pressures, shape fishery dynamics in the southern North Sea under changing scenarios?	Marine system in the North Sea	Agent-based model and behavioral theory
Mangold-Döring et al. (2024)	How Relevant Are Temperature Corrections of Toxicity Parameters in Population Models for Environmental Risk Assessment of Chemicals?	How critical is it to incorporate temperature corrections in dynamic energy budget models and toxicokinetic – toxicodynamic models to improve the realism and protective capacity of population models used for chemical risk assessment?	Freshwater system	Individual-based model
Marques et al. (2024	Using individual-based demographic modelling to estimate the impacts of anthropogenic mortality on territorial predators	How does increased anthropogenic mortality, particularly through electrocution, impact the population dynamics of territorial predators such as Bonelli's eagle?	Terrestrial ecosystems in Portugal	Individual-based model
Muller et al. (2024)	Site-level and spatially-explicit modelling provides some insights on key factors driving seasonal dynamics of an intertidal seagrass	What are the key environmental drivers, including hydrodynamic forces and light conditions, that determine the seasonal dynamics and spatial distribution of intertidal seagrass meadows?	seagrass meadows in France	coastal hydrodynamics model and machine learning
Nothaaß and Huth (2025)	Community recomposition caused by species extinction in the colonization-competition trade-off model for vegetation	How does an abrupt species extinction affect equilibrium community structure and biodiversity within the colonization–competition framework?	Grasslands	Colonization–competition trade-off (metacommunity) model
Ogawa et al. (2024)	Functional Responses in Habitat Selection as a Management Tool to Evaluate Agri-environment Schemes for Farmland Birds	Do farmland birds exhibit functional responses in their habitat selection relative to changes in the availability different land-use types, and how does this influence their distribution?	Agricultural landscapes in Germany	Hierarchical distance sampling models combined with mixed-effects and linear models
Peters et al. (2025)	Modelling the dynamics of soil moisture and soil water salinity in tropical saltmarshes	How can tidal flooding, rainfall, and evapotranspiration be modeled to predict soil	Tropical saltmarsh	Mechanistic eco-hydrological water balance model

(*continued on next page*)

Table 1 (*continued*)

Study	Title	Scientific Key Question	Ecosystem	Model type
		moisture and salinity patterns in tropical saltmarshes?		
Rammer et al. (2024)	The individual-based forest landscape and disturbance model iLand: Overview, progress, and outlook	How can an individual-based forest landscape model like iLand be utilized to simulate forest dynamics and disturbance impacts under various environmental and management scenarios?	Temperate forests	Individual-based forest landscape model
Scheiter et al. (2024)	Modeling drought mortality and resilience of savannas and forests in tropical Asia	How do drought events influence mortality and recovery dynamics in tropical Asian savannas and forests under climate change?	Savannas and forests in tropical Asia	Trait-based dynamic global vegetation model
Schorn et al. (2025)	Optimising profits from timber harvest and biodiversity conservation value in a central European beech forest using a novel bioeconomic forestry model	How can timber harvesting be optimized to maximize economic profit while simultaneously preserving biodiversity in central European beech forests?	Beech forests in Germany	Ecological-economic optimization model
Takolander et al. (2025)	Cross-realm transferability of species distribution models–Species characteristics and prevalence matter more than modelling methods applied	Does the transferability of SDMs depend more on inherent species characteristics and prevalence than on the specific modelling method used?	marine environment and freshwater lake in Finland	species distribution models
Verbeeck et al. (2024)	Towards a liana plant functional type for vegetation models	What are the essential traits and processes that should define a liana plant functional type for accurate representation in vegetation models?	Tropical forests	vegetation modeling with plant functional types
Wang et al. (2025)	Modeling Rangelands as Complex Adaptive Socio-Ecological Systems: An Agent-Based Model of Pyric Herbivory	How do adaptive management strategies regarding grazing and fire affect vegetation dynamics, forage production, and cattle performance in rangelands?	Semi-arid rangelands, USA	Agent-based model
Wimmler and Berger (2024)	How root-grafted trees form networks: Modeling network dynamics with pyNET	Which processes and factors are critical in determining the formation and topology of root graft networks in trees?	Forested ecosystems (temperate forests and mangrove systems)	Individual-based forest growth model

from a beech-dominated forest in Thuringia, Germany, the model quantifies the trade-offs between maximizing economic returns and retaining large habitat trees.

Verbeeck et al. (2024). This paper reviews the challenges of representing lianas in vegetation models and proposes a conceptual framework for defining a liana plant functional type based on key morphological and physiological traits. It discusses potential implementation strategies and data requirements to improve liana representation in ecosystem simulations.

Wimmler and Berger (2024). This study introduces pyNET - an agent-based model built on the pyMANGA platform - to explore the emergence and structure of root graft networks among trees. It examines how costs of graft formation, resource redistribution, and individual tree characteristics drive network properties such as group size and connectivity.

4. Predictive modelling approaches in marine, coastal and fisheries systems

This thematic block brings together contributions that deal with the dynamics of marine and coastal ecosystems as well as work that addresses behavioural ecology aspects. This includes contributions that focus on the prediction of species distributions and the transferability of models as well as those that present models and sensitivity analyses for environmental and chemical risk assessments.

Guisnet et al. (2025). This study conducts a comprehensive global sensitivity analysis - using both Morris screening and Sobol variance-based methods - on a mechanistic toxicokinetic/toxicodynamic model for Lemna to determine which parameters most affect biomass and growth rate responses under different exposure scenarios. The findings help prioritize key physiological and toxicokinetic/toxicodynamic parameters to improve model predictions for pesticide impacts.

Mangold-Döring et al. (2024). This paper investigates the impact of incorporating temperature corrections into toxicity parameters within an individual-based model that combines a dynamic energy budget framework with toxicokinetic-toxicodynamic models. By combining these approaches with a temperature-corrected version, the study shows that applying temperature corrections can significantly alter population dynamics under varying exposure scenarios.

Muller et al. (2024). This paper presents a hybrid modelling framework that couples a coastal hydrodynamic model with machine learning to predict the seasonal dynamics of intertidal seagrass. It shows how local environmental conditions, such as light availability, and physical stressors, such as shear stress, control seagrass growth and spatial variability in Arcachon Bay, France.

Peters et al. (2025). This study introduces a mechanistic eco-hydrological model that simulates soil water dynamics to predict soil moisture and salinity in tropical saltmarshes. By applying the model to a site in Brazil, the authors demonstrate how variations in tidal flooding and precipitation drive seasonal patterns of drought and salt stress, which in turn explain the observed vegetation zonation.

Takolander et al. (2025). This study evaluates the geographic transferability of species distribution models by testing four modelling methods when extrapolating from a brackish marine system to a freshwater lake in Finland. The authors demonstrate that species-specific traits and prevalence play a far more critical role in transferability than the choice of modelling algorithm.

We hope that the papers chosen for this Special Issue demonstrate the range of contemporary issues being addressed through ecological modelling.

CRediT authorship contribution statement

Rico Fischer: Conceptualization, Writing – original draft, Writing – review & editing. **Martin Drechsler:** Writing – review & editing. **Karin Frank:** Writing – review & editing. **Uta Berger:** Writing – review & editing. **Hsiao-Hsuan Wang:** Conceptualization, Writing – original draft, Writing – review & editing. **Christina Semeniuk:** Writing – review & editing. **Amanda Armstrong:** Writing – review & editing. **Volker Grimm:** Conceptualization, Writing – original draft, Writing – review & editing.

Declaration of competing interest

All authors declare that they have no conflicts of interest.

Acknowledgements

We gratefully acknowledge our colleagues who contributed their time and expertise to provide thorough and thoughtful reviews of the papers included in this Special Issue. We also would like to thank the faculty, students, and staff in the Department of Ecological Modelling at the Helmholtz Centre for Environmental Research - UFZ for their hospitality, logistical support, and organizational support, and fellow members of European Chapter of the International Society for Ecological Modelling who chaired sessions and helped in numerous other ways during the Conference. We also thank the sponsors of the ECEM 2023 conference (https://ecem23.eu/). Finally, we would like to express our gratitude to everyone who attended the conference for the engaging, enjoyable, and vibrant idea exchanges that defined it and helped to fortify our global ecological modelling network.

References

Anders, T., Hetzer, J., Knapp, N., Forrest, M., Langan, L., Tölle, M.H., Wellbrock, N., Hickler, T., 2025. Modelling past and future impacts of droughts on tree mortality and carbon storage in Norway spruce stands in Germany. Ecol. Model. 501, 110987.

Axer, M., Schlicht, R., Blickensdörfer, L., 2025. Quantile regression for estimating Douglas-fir natural regeneration potential using the R package quaxnat: advanced ecological modeling for the management of nature conservation and silviculture. Ecol. Model. 501, 110968.

Boyce, J., Elles, L., Henkel, S., Kasperidus, H.D., Padberg, A., Scholz, M., Schorn, M.E., Sickert, A., Vieweg, M., Rüger, N., 2025. How can oak regeneration in the leipzig floodplain forest be effectively supported by femel plantations? Application of a demographic forest model. Ecol. Model. 499, 1109, 20.

Crispim-Mendes, T., Roos, D., Ferreira, C.M., Paupério, J., Silva, J.P., Godinho, S., Alves, P.C., Mira, A., Beja, P., Lambin, X., Pita, R., 2024. Patch spatial attributes and time to disturbance affect the emergence of source local populations within ephemeral habitats. Ecol. Model. 496, 110839.

Curk, T., Rast, W., Portas, R., Kohles, J., Shatumbu, G., Cloete, C., Curk, T., Radchuk, V., Aschenborn, O., Melzheimer, J., 2025. Advantages and disadvantages of using social information for carcass detection–a case study using white-backed vultures. Ecol. Model. 499, 110941.

Elles, L., Boyce, J., Henkel, S., Kasperidus, H.D., Scholz, M., Schorn, M.E., Vieweg, M., Wirth, C., Rüger, N., 2025. Supporting conservation planning in a national biodiversity hotspot – projecting species composition across a groundwater level gradient using a demographic forest model. Ecol. Model. 501, 110996.

Ewers, R.M., Cook, J., Daniel, O.Z., Orme, C.D.L., Groner, V., Joshi, J., Rallings, A., Rallings, T., Amarasekare, P., 2024. New insights to be gained from a Virtual Ecosystem. Ecol. Model. 498, 110866.

Ferraro, D.O., Ghersa, F., Castro, R., 2024. Predicting land use and environmental dynamics in Argentina's Pampas region: an agent-based modeling approach across varied price and climatic scenarios. Ecol. Model. 498, 110881.

Guisnet, C., Reichenberger, S., García, E.A., Voss, F., 2025. Global sensitivity analysis of the harmonized Lemna model. Ecol. Model. 501, 111016.

Holtmann, A., Huth, A., Bohn, F., Fischer, R., 2024. Assessing the impact of multi-year droughts on German forests in the context of increased tree mortality. Ecol. Model. 492, 110696.

Letschert, J., Müller, B., Dressler, G., Möllmann, C., Stelzenmüller, V., 2025. Simulating fishery dynamics by combining empirical data and behavioral theory. Ecol. Model. 501, 111036.

Mangold-Döring, A., Buddendorf, W.B., van den Brink, P.J., Baveco, J.M., 2024. How relevant are temperature corrections of toxicity parameters in population models for environmental risk assessment of chemicals? Ecol. Model. 498, 110880.

Marques, A.T., Crispim-Mendes, T., Palma, L., Pita, R., Moreira, F., Beja, P., 2024. Using individual-based demographic modelling to estimate the impacts of anthropogenic mortality on territorial predators. Ecol. Model. 493, 110752.

Muller, H., Auclair, E., Woehrel, A., Ganthy, F., Tandeo, P., Wu, P.P.-Y., Chercham, C., Marzloff, M.P., 2024. Site-level and spatially-explicit modelling provides some insights on key factors driving seasonal dynamics of an intertidal seagrass. Ecol. Model. 495, 110802.

Nothaaß, D., Huth, A., 2025. Community recomposition caused by species extinction in the colonization-competition trade-off model for vegetation. Ecol. Model. 499, 110906.

Ogawa, R., Engler, J.O., Cord, A.F., 2024. Functional responses in habitat selection as a management tool to evaluate agri-environment schemes for farmland birds. Ecol. Model. 494, 110778.

Peters, R., Reis, A.C.A., Mehlig, U., Wimmler, C., Vollhüter, J., Pimple, U., Tietjen, B., Berger, U., 2025. Modelling the dynamics of soil moisture and soil water salinity in tropical saltmarshes. Ecol. Model. 504, 111089.

Rammer, W., Thom, D., Baumann, M., Braziunas, K., Dollinger, C., Kerber, J., Mohr, J., Seidl, R., 2024. The individual-based forest landscape and disturbance model iLand: overview, progress, and outlook. Ecol. Model. 495, 110785.

Schorn, et al., 2025. Optimising profits from timber harvest and biodiversity conservation value in a central European beech forest using a novel bioeconomic forestry model. Ecol. Model.

Scheiter, S., Kumar, D., Pfeiffer, M., Langan, L., 2024. Modeling drought mortality and resilience of savannas and forests in tropical Asia. Ecol. Model. 494, 110783.

Takolander, A., Forsblom, L., Hellsten, S., Ilmonen, J., Jokinen, A.-P., Kallio, N., Koponen, S., Väkevä, S., Virtanen, E., 2025. Cross-realm transferability of species distribution models–species characteristics and prevalence matter more than modelling methods applied. Ecol. Model. 499, 110950.

Verbeeck, H., De Deurwaerder, H.P.T., Kearsley, E., Moorthy, S.M.K., Mundondo, F.M., Coppieters, K., Schnitzer, S.A., Longo, M., Peaucelle, M., Bauters, M., Meunier, F., 2024. Towards a liana plant functional type for vegetation models. Ecol. Model. 498, 110901.

Wang, H.-H., Grant, W.E., Birt, A.G., Wilcox, B.P., 2025. Modeling rangelands as complex adaptive socio-ecological systems: an agent-based model of pyric herbivory. Ecol. Model. 501, 1110, 20.

Wimmler, M.-C., Berger, U., 2024. How root-grafted trees form networks: modeling network dynamics with pyNET. Ecol. Model. 498, 110916.

Rico Fischer[a,*], Martin Drechsler[b], Karin Frank[b,c,d], Uta Berger[e], Hsiao-Hsuan Wang[f], Christina Semeniuk[g], Amanda Armstrong[h], Volker Grimm[b,d,i]

[a] *Julius Kühn-Institute (JKI) - Federal Research Center for Cultivated Plants, Institute for Forest Protection, Quedlinburg, Germany*

[b] *Helmholtz-Centre for Environmental Research - UFZ, Leipzig, Germany*

[c] *University of Osnabrück, Institute of Environmental Systems Research (IUSF), Osnabrück, Germany*

[d] *German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Leipzig, Germany*

[e] *TU Dresden, Faculty of Environmental Sciences, Tharandt, Germany*

[f] *Texas A&M University, Department of Ecology and Conservation Biology, College Station, Texas, USA*

[g] *University of Windsor, Windsor, Ontario, Canada*

[h] *NASA Goddard Space Flight Center, Maryland, USA*

[i] *University of Potsdam, Plant Ecology and Nature Conservation, Potsdam, Germany*

[*] Corresponding author.
E-mail address: rico.fischer@julius-kuehn.de (R. Fischer).